The Impact of Industrial Sites on Industrial Employment Growth: A Case Study of Appalachian Ohio

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Introduction

Currently, much emphasis is being given to industrial parks as an inducement to industrial location, e.g. (3). However, industrial parks require substantial investment. Many rural communities cannot afford to develop industrial parks because they lack the financial resources. Short of developing an industrial park, providing industrial sites is an alternative recommended by many developers. Industrial sites require relatively less investment, but may not be as attractive to industrial firms. The objective of this paper is to analyze the impact of industrial sites (to include parks) on employment growth.

For the purposes of this paper, an industrial site is defined as a parcel of land owned either by a private or public agency that has been designated and/or advertised for the specific purpose of locating industrial firms. More specifically, an industrial site is a parcel of land having these minimum characteristics (1, 12):

1. Level to gently sloping topography with a 10 percent slope as an extreme limit.
2. Suitable soil condition for industrial use.
3. Flood-free (100-year or intermediate flood plain).
4. Within three miles of a highway or within 1,000 feet of a railroad facility.
5. Adequate capacity of water and electricity within a mile of the site. Availability of other public utilities, for example, sanitary sewer and natural gas, may be necessary for certain industrial uses.

While these characteristics are considered as minimum for most industrial uses, some industrial firms may have additional and specific requirements. The need for air transportation is an example.

There are many definitions of an industrial park. Hitzhusen and Gray (7, p. 28) define an industrial park as "a tract of land set aside for industrial purposes with the following characteristics:

a. It is under single ownership and/or management,

b. Utilities are available for hook-up by firms within the park,

c. Uses a firm may make of the park are regulated, and

d. The park is developed for use by two or more firms."

Given the above definition, all industrial parks qualify as industrial sites; however, the opposite is not true.

The Model

It is hypothesized that the availability of industrial sites, population characteristics, location characteristics, and transportation availability influence an industrial development effort. An employment growth relationship can be expressed as:

(1) Growth = f (industrial sites, population characteristics, location characteristics, transportation availability)

Population is a general measure of the size of the employment area. More specifically, it serves as a proxy measure of labor force size and expected availability of services. Other population characteristics such as schooling are expected to affect employment growth through their impact on the industrial mix of the employment area.

There are several factors that cause industrial firms to seek locations other than their traditional urban sites. The list includes a continuum of factors from those that make cities unattractive for firms

to factors that firms consider to be advantageous for locating in rural areas because of recent technological developments. Although this study is not on industrial location per se, it is helpful to recognize some of these factors.

Excessive growth of metropolitan areas has increased both social and economic costs (5). This may bid up prices of factors of production (labor costs at all levels, land, and capital). Land for industry may not be readily available (8). In contrast, many rural areas have a large supply of trainable labor and an adequate supply of inexpensive land (10). These factors, coupled with the present efficient transportation network and less reliance on raw materials in their natural state, are making rural areas more and more attractive.

Other factors often being considered in location decisions are markets, services facilities or industries, experience of existing industries, tax environment, community attitudes, schools and churches, and adequate water (8, 13). The relative importance of these factors is expected to vary among firms. Despite the economic implications of many of the above factors, small firms often base their location decisions on personal motivations (4). It is the bigger firms that tend to rely on economic factors (14).

Not all industries are expected to be successful operating in a rural environment. It is expected that only those firms with certain characteristics will find rural locations suitable (2, 18). Similarly, only those communities with adequate facilities and amenities will be found attractive to industrial firms. For this reason, many communities have intensified their effort to attract industrial firms, some by offering industrial parks or sites.

The Data

The 28 Appalachian counties in Ohio comprise the sample (Figure 1). A preliminary list of industrial sites was compiled from (1, 6, 9, 12, 15, 19). Local organizations, like the Community Improvement Corporation (C.I.C.), the Chamber of Commerce, and utility and railroad companies, were contacted for additional information to complete the inventory. Preliminary site listings by county were sent to County Extension Agents in the Appalachian region. The agents were asked to verify the availability of all sites identified and to identify any omitted sites. All other data for the study were gathered from secondary sources.

A total of 149 industrial sites were identified. Of the 149 industrial sites, information on 80 was obtained from available publications. In addition, utility companies (electric and gas) provided information on 25 of the sites, railroad companies on 13, and public organizations, such as the C.I.C. and the Chamber of Commerce, on 14 of the sites. Information on the remaining 17 sites was provided by two or more of the sources mentioned.

A summary of the distribution of industrial sites by county is presented in Table 1. At the time data on industrial sites were gathered, no known industrial sites were available in Lawrence and Morgan counties. Twelve counties had 1 to 4 sites. Nine counties had 5 to 8 sites. Washington, Tuscarawas, and Scioto counties had 10, 11, and 12 industrial sites, respectively. Athens and Ross counties each had 13 sites.

Total site acreage varied from 36 to 3,021 acres. About two-thirds of the counties had less than 1,000 acres, and approximately one-half had less than 350 acres. Clermont county had the largest acreage with 3,021 acres. The mean acreage per industrial site by county ranged from 20.3 to

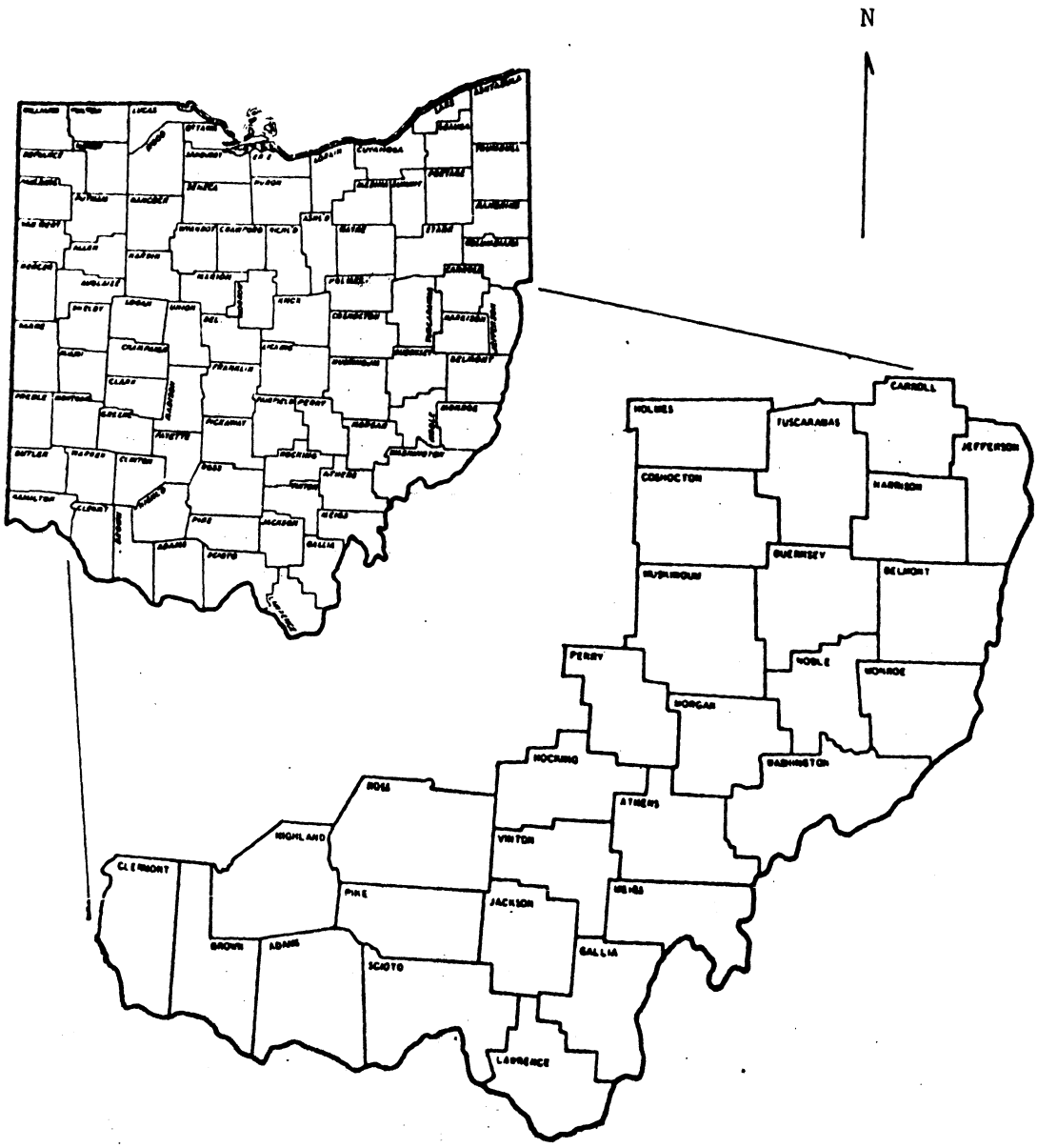

Figure 1. Appalachian Ohio Counties

Table 1. Summary of Industrial Site Characteristics: Appalachian Ohio, 1978

County	Number of Sites	Mean Acreage	Total Acreage
Adams	8	57.1	457
Athens	13	53.8	700
Belmont	4	48.3	193
Brown	6	352.5	2,115
Carroll	2	34.0	68
Clermont	6	503.5	3,201
Coshocton	5	41.2	206
Gallia	1	80.0	80
Guernsey	6	178.3	1,070
Harrison	2	36.0	72
Highland	3	67.0	201
Hocking	4	20.3	81
Holmes	5	34.8	174
Jackson	8	98.0	784
Jefferson	8	148.5	1,188
Lawrence	-	-	-
Meigs	3	666.7	2,000
Monroe	4	244.5	978
Morgan	-	-	-
Muskingum	6	232.0	1,392
Noble	1	85.0	85
Perry	4	80.5	322
Pike	3	134.3	403
Ross	13	129.3	1,681
Scioto	12	210.3	2,523
Tuscarawas	11	125.2	1,337
Vinton	1	36.0	36
Washington	10	196.7	1,967
APPALACHIAN OHIO	149	155.5	23,174

666.7 acres. Twenty counties had mean site size of less than 150 acres, and about one-third of the counties had an average site size smaller than 50 acres.

Two alternative measures of employment growth are used in the analysis. Employment change is the arithmetic change in employment from 1966 to 1976, and percent employment change is the percent change in employment from 1966 to 1976. Employment is covered employment for unemployment compensation (16). Increased unemployment coverage between 1966 and 1976 imparts an upward bias to employment change, but this bias is not expected to be systematically related to factors affecting employment growth in the Ohio Appalachian counties.

The number of explanatory variables which can be used as measures of characteristics in equation (1) is constrained by the 28 observations on Appalachian counties. Availability of industrial sites is measured by sites defined as total acres of industrial sites in 1978 as compiled from the survey. Transportation availability is measured by state road defined as miles of state and federal roads per square mile of county area in 1977 (17). Two variables measure location characteristics. Distance urban is miles from the county seat to the nearest city with population greater than 100,000, and Ohio River is equal to one for counties adjacent to the Ohio River and zero otherwise. Three population characteristics variables are defined. Unemployment is the 1970 unemployment rate (16), and school is 1970 median school years completed (20). Population is used as a set of dummy variables where POP 1 is one if 1970 population is 25,000 or less, and zero otherwise, POP 2 is one when population is 25,001 to 50,000 and zero otherwise, POP 3 is one when population is 50,001 to 75,000 and zero otherwise, and counties with population over 75,000 comprise the control group.

Sites in 1978 is a proxy for the availability of industrial sites during 1966 to 1976. Since most industrial sites disappear from listings when occupied, it would have been very difficult, if not impossible, to obtain an inventory of sites for an earlier year. It is hypothesized that the provision of industrial sites is a long-run undertaking. If industrial sites stimulate employment growth, then a county must remain active in developing new sites as existing ones are occupied.[1/] Sites enters the estimating equation in log form. Preliminary analysis suggested the relationship between sites and growth was nonlinear.

A dummy variable for whether a county had an industrial park was not statistically significant and was deleted to preserve degrees of freedom. A measure of site quality was not used because at the county level there was little variation in availability of recommended services such as water and roads.

State road is also for 1977, but road mileage is expected to change very slowly over time. Railroad mileage was not available. Population was used as a set of dummy variables to retain it as a control variable for labor force size and service availability while minimizing the simultaneous variable problem inherent between population and employment. The further modeling required to deal with this simultaneity was beyond the scope of this study.

Results

Results of the two equations, one for each measure of employment growth, are presented in Table 2. Both equations are statistically significant at the one percent level.

Table 2. Estimates of Employment Growth Functions (1966-1976)*

Independent Variables	Growth I	Percent Growth II
Intercept	6177.45	348.69
Log Sites	159.56 (1.98)	2.84 (1.23)
State Road	9544.43 (1.70)	388.23 (2.41)
Distance Urban	-20.41 (1.21)	-0.99 (2.04)
Ohio River	215.25 (0.30)	31.55 (1.53)
School	-252.34 (0.54)	-38.84 (2.91)
Unemployment	-106.03 (0.68)	1.55 (0.35)
POP 1	-3922.47 (3.96)	38.56 (1.36)
POP 2	-2684.11 (2.94)	44.91 (1.71)
POP 3	-674.37 (0.66)	48.00 (1.63)
R^2	0.75	0.66
F	6.08	3.92

* t-values are in parentheses

Acres of Industrial Sites

The two functional estimates show that the log of acres of industrial sites is positively related to industrial growth. The relationship is constrained to be nonlinear. Initial increases in acreage will result in relatively big changes in expected employment. Since sites are a proxy measure of availability for 1966-1976, only the relative magnitudes are relevant; the numbers have no definite meaning.

Using equation I, a county with 100 acres of industrial sites accounts for an employment increase of 735 in comparison to counties with no sites. A further increase in site size does not increase employment proportionally. An increase of total site acres from 100 to 827, the mean site acreage of counties in the Appalachian region, increases expected employment by 337 to 1,072.

Equation II shows that percent employment change and sites are related in a similar manner. It is estimated that if total site acreage is 100, as compared to zero, percent employment change will increase by approximately 13 percentage points. Any further increase in sites will not increase employment growth proportionately.

Population

In equation I, the relationship of population to employment change is estimated to be positive. The effect of population on employment change is greatest when population is over 75,000. When population is 25,000 or less, employment is estimated to be smaller by 3,922 jobs. In equation II, there is a positive relationship between population and percent employment change when population is 75,000 or less. When population is greater than 75,000, percent employment change is found to be lowest.

Miles of State Road per Square Mile

State road mileage is used as a proxy for transportation availability. Railway mileage was not available. According to both equations, counties with more miles of road per square mile have greater expected employment increases than counties with less miles of road. According to equation I, a difference of 0.10 mile per square mile was estimated to account for a difference of 954.4 jobs. The percentage point increase in employment for each 0.10 mile of road per square mile is estimated to be 38.8 from equation II.

Distance Urban

The relationship between distance urban and employment is negative in both equations. Other things equal, the farther the county is from a city of 100,000 population, the lower is employment growth. It is estimated that employment growth decreases by as much as 20 jobs for a mile increase in distance from equation I. Percent employment change decreases by 0.99 percentage points for a mile increase in distance.

Other Variables

Counties adjacent to the Ohio River are expected to have an employment advantage over the other counties. However, only the estimate of equation II has a t-ratio greater than one. According to the equation, counties adjacent to the river have 31.55 percentage points higher employment growth than the other counties.

More years of schooling decreases employment growth according to both estimates. However, only the coefficient in equation II has a t-ratio greater than one. Percent employment change is estimated to decrease by approximately 39 percentage points for each additional year of schooling.

The coefficients for unemployment have small t-ratios in both equations.

Conclusions and Implications

The major focus of this paper was to test the impact of industrial sites on employment growth. Other factors necessary for industrial development identified and tested were location, transportation, and population characteristics.

The recommendation that rural communities develop industrial sites as an inducement to industrial location is supported by the results obtained. Acres of industrial sites have positive estimated impacts on both employment growth and percent employment growth. However, in determining the likely impact of industrial sites, a rural community should examine other characteristics which affect employment growth.

Locational advantages and availability of adequate transportation facilities have a positive influence on an industrial development effort. Miles of state and federal highways, distance from large urban centers and locations on the Ohio River all gave results which supported the advantages of these characteristics to a county.

The role of population in an industrial development effort is more difficult to identify. While population has a positive impact on employment growth and percent employment growth, population may also be dependent on the availability of economic opportunities in the county. This suggests a simultaneity problem in need of further research.

More schooling was found to be negatively related to employment growth. If years of schooling is synonymous with the level of skill, then it appears that an industrial development effort in Appalachian Ohio or similar areas will be more productive if it is concentrated on industries requiring labor with low skills.

In conclusion, the results of this study generally support the hypothesis tested. However, the model is exploratory. There was little previous research on which to draw, the number of observations was small, and the only measure of site availability was for a later time than the employment growth period.

FOOTNOTES

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1/ Since the industrial site data were collected as of 1978, one competing hypothesis is that sites is an endogenous variable. Attempts to estimate the employment growth relationship treating sites as endogenous were not successful because the stage one reduced form equation for sites had explanatory power too low to obtain meaningful instruments for the variable sites (11, p. 392).

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